ABSTRACT OF THE DISCLOSURE

Disclosed are compositions and methods for increasing the nutritional value of plants and plant parts. In illustrative embodiments PEAMT and ΔPEAMT polynucleotide and polypeptide compositions are disclosed as well as their use in modulating the levels of lipid compounds, and particularly, regulating the level of phosphatidylcholine, and its precursors in plants and seeds derived therefrom. Also disclosed are methods for modulating the level of glycine betaine and choline-*O*-sulfate in cells, and increasing the tolerance of transformed plants to osmotic and cryogenic stress.